

40. (NEW) The apparatus as claimed in claim 36, wherein the ATSI further comprises value fields, the sampling frequencies comprise first to sixth sampling frequencies including the 176.4 Khz and 192 Khz sampling frequencies, and the ATSI indicates the first to six sampling frequencies by corresponding states of two of the value fields.

41. (NEW) The apparatus as claimed in claim 40, wherein one of the two value fields indicates whether the sampling frequency is one of 176.4 Khz and 192 Khz.

42. (NEW) The apparatus as claimed in claim 41, wherein,  
the other of the two value fields has a state, and, if the one value field indicates the sampling frequency is one of 176.4 Khz and 192 Khz, the state of the other value field indicates the sampling frequency is 176.4 Khz or 192 Khz.

43. (NEW) The apparatus as claimed in claim 40, wherein,  
a first of the two value fields has a first or a second state, the first state indicates the sampling frequency is one of 44.1KHz, 88.2KHz and 176.4KHz, and the second state indicates the sampling frequency is one of 48KHz, 96KHz, and 192KHz,

a second of the two value fields has a state which indicates the sampling frequency is 176.4 KHz or 192 KHz.

**REMARKS**

Claims 1-43 are pending, claim 1 has been amended, and claim 36-43 have been added. The title has also been amended to be more descriptive. In view of the accompanying

**Serial No. 09/618,731**

**Docket No. 1317.1014CIPCIP/MDS/JGM**

separate Letter to the Examiner Requesting Approval of Changes to the Drawings, a correction to FIG. 26 has been requested to correct a typographical error.

No new matter has been added.

**ATTACHMENT:**

Attached hereto is a "Version With Markings to Show Changes Made," comprising a marked-up version of changes made to the Claims by the current amendment.

**CONCLUSION:**

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot. And further, it is respectfully submitted that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited by the Examiner contacting the undersigned attorney for a telephone interview to discuss resolution of such issues.



Serial No. 09/618,731

Docket No. 1317.1014CIP/CIP/MDS/JGM

**VERSION WITH MARKING TO SHOW CHANGES MADE**

**IN THE CLAIMS:**

Please **AMEND** claim 1. The remaining claims are reprinted, as a convenience to the Examiner, as they presently stand before the U.S. Patent and Trademark Office.

1. (ONCE AMENDED) An apparatus to record data on a DVD, comprising:  
an encoder to encode the data as effective data of a DVD-Audio format comprising an audio manager (AMG) having information on audio titles (ATS), each ATS having audio title set information (ATSI) followed by contiguous audio objects (AOBs)[,] in an audio title set (AUDIO\_TS) of the DVD; and  
an optical pickup to record the data on the DVD.

2. (NOT AMENDED) The apparatus as claimed in claim 1, wherein said encoder stores said data on the DVD in a plurality of audio streams, wherein said audio streams are linear PCM audio streams or compression coded audio streams using a corresponding extension algorithm.

3. (NOT AMENDED) An apparatus for recording data on a DVD-Audio disk, the apparatus comprising:  
an encoding unit to generate said data to be reproduced and information on said data to be reproduced; and  
an optical pickup to store said data to be reproduced in a data zone of the DVD-Audio and to store said information on said data to be reproduced in an information zone of the DVD-Audio, said information zone includes directories of a video title set (VIDEO\_TS) and an audio

title set (AUDIO\_TS), wherein said AUDIO\_TS directory includes information on an audio manager (AMG) having information on audio titles, wherein said data zone includes said audio titles each having audio title set information (ATSI) followed by a plurality of contiguous audio objects (AOBs), said ATSI includes a plurality of audio stream attributes each having an audio coding mode, a first, second or third quantization bit number corresponding to the data to be reproduced, a first, second, third, fourth, fifth or sixth sampling frequency corresponding to the data to be reproduced, and decoding algorithm information relating to a number of audio channels of the data to be reproduced, and each of said AOBs includes a plurality of audio packs recorded with audio data corresponding to the decoding algorithm stored in the audio stream attribute.

4. (NOT AMENDED) The apparatus as claimed in claim 3, wherein if said audio coding mode is linear pulse code modulated (PCM) audio, the encoding unit determines a maximum number of said audio channels by the following Eq. 1:

Eq. 1

$$N = \frac{Mb\gamma}{Fs * Qb},$$

wherein Fs is the sampling frequency(Hz), Qb is the quantization bit number, Mby is the maximum data transfer rate(Mbps) of the DVD-Audio disk, and N is the maximum number of said audio channels determined by the data transfer rate, sampling frequency and quantization bit number of the DVD-Audio disk.

5. (NOT AMENDED)The apparatus as claimed in claim 3, wherein if said audio coding mode is a compression coding system, the encoding unit determines a maximum number of said audio channels by the following Eq. 2:

Eq. 2

$$N = \frac{Mby * Cc\gamma}{Fs * Qb},$$

wherein  $F_s$  is the sampling frequency(Hz),  $Q_b$  is the quantization bit number,  $Mby$  is the maximum data transfer rate(Mbps) of the DVD-Audio disk,  $Cc\gamma$  is a compression ratio according to a DTS compression coding system and  $N$  is the maximum number of said audio channels determined by data transfer rate, sampling frequency and quantization bit number of the DVD-Audio disk.

6. (NOT AMENDED) The apparatus as claimed in claim 3, wherein if said audio coding mode is linear pulse code modulated (PCM) audio, the encoding unit determines said first to third quantization bit numbers to be respectively 16bits, 20bits and 24bits, said first to third sampling frequencies to be respectively 44.1KHz, 88.2KHz and 176.4KHz, a maximum number of said audio channels is 8, and the number of said channels by the following equation:

$$N = \frac{Mbr}{Fs * Qb};$$

wherein,

$F_s$  is the sampling frequency (Hz) of the data to be reproduced,  $Q_b$  is the quantization bit number (bits) of the data to be reproduced,  $Mbr$  is a maximum data transfer rate (Mbps) of the DVD-Audio disk,  $N$  is a maximum number of recording channels as determined by the maximum data transfer rate, sampling frequency and quantization bit number of the DVD-Audio disk.

7. (NOT AMENDED) The apparatus as claimed in claim 3, wherein if said audio coding mode is pseudo lossless compression coding, the encoding unit determines said first to third quantization bit numbers of the data to be reproduced before compression to be respectively

16bits, 20bits and 24bits, said first to third sampling frequencies to be respectively 44.1KHz, 88.2KHz and 176.4KHz, a maximum number of said audio channels to be 8, and the number of said channels is determined by the following equation:

$$N = \frac{Mbr * Ccr}{Fs * Qb};$$

wherein,

Fs is the sampling frequency (Hz) of the data to be reproduced, Qb is the quantization bit number (bits) of the data to be reproduced, Mbr is a maximum data transfer rate (Mbps) of the DVD-Audio disk, Ccr is a compression ratio according to a DTS compression coding system, and N is a maximum number of recording channels determined by the maximum data transfer rate, sampling frequency and quantization bit number of the DVD-Audio disk.

8. (NOT AMENDED) The apparatus as claimed in claim 3, wherein said encoding unit stores said data on the DVD-Audio in a plurality of audio streams, wherein said audio streams are linear PCM audio streams or compression coded audio streams using a corresponding extension algorithm.

9. (NOT AMENDED) An apparatus for recording data on a DVD-Audio disk and a DVD-Video disk, the apparatus comprising:

an encoding unit to generate said data to be reproduced and information on said data to be reproduced; and

an optical pickup to store said data to be reproduced in a data zone of said DVD-Audio disk and to store said information in an information zone of said DVD-Audio disk, said information zone includes directories of a video title set (VIDEO\_TS) and an audio title set (AUDIO\_TS), wherein said AUDIO\_TS directory includes information on an audio manager

(AMG) having information on audio titles, wherein said data zone includes said audio titles each having audio title set information (ATSI) followed by a plurality of contiguous audio objects (AOBs), said ATSI includes a plurality of audio stream attributes each having an audio coding mode, a first, second or third quantization bit number corresponding to the data to be reproduced, a first, second, third, fourth, fifth or sixth sampling frequency corresponding to the data to be reproduced, and decoding algorithm information relating to a number of audio channels of the data to be reproduced, and each of said AOBs includes a plurality of audio packs recorded with audio data corresponding to the decoding algorithm stored in the audio stream attribute, and said optical pickup storing video data in a data zone of said DVD-Video disk.

10. (NOT AMENDED) The apparatus as claimed in claim 9, wherein said encoding unit stores said data on the DVD-Audio in a plurality of audio streams, wherein said audio streams are linear PCM audio streams or compression coded audio streams using a corresponding extension algorithm.

11. (NOT AMENDED) The apparatus as claimed in claim 9, wherein if said audio coding mode is linear pulse code modulated (PCM) audio, the encoding unit determines a maximum number of said audio channels by the following Eq. 1:

Eq. 1

$$N = \frac{Mby}{Fs * Qb},$$

wherein  $F_s$  is the sampling frequency(Hz),  $Q_b$  is the quantization bit number,  $Mby$  is the maximum data transfer rate(Mbps) of the DVD-Audio disk, and  $N$  is the maximum number of said audio channels determined by the data transfer rate, sampling frequency and quantization

bit number of the DVD-Audio disk.

12. (NOT AMENDED)The apparatus as claimed in claim 9, wherein if said audio coding mode is a compression coding system, the encoding unit determines a maximum number of said audio channels by the following Eq. 2:

Eq. 2

$$N = \frac{Mby * Ccy}{Fs * Qb},$$

wherein Fs is the sampling frequency(Hz), Qb is the quantization bit number, Mby is the maximum data transfer rate(Mbps) of the DVD-Audio disk, Ccy is a compression ratio according to a DTS compression coding system and N is the maximum number of said audio channels determined by data transfer rate, sampling frequency and quantization bit number of the DVD-Audio disk.

13. (NOT AMENDED)The apparatus as claimed in claim 9, wherein if said audio coding mode is linear pulse code modulated (PCM) audio, the encoding unit determines said first to third quantization bit numbers to be respectively 16bits, 20bits and 24bits, said first to third sampling frequencies to be respectively 44.1KHz, 88.2KHz and 176.4KHz, a maximum number of said audio channels is 8, and the number of said channels by the following equation:

$$N = \frac{Mbr}{Fs * Qb};$$

wherein,

Fs is the sampling frequency (Hz) of the data to be reproduced, Qb is the quantization bit number (bits) of the data to be reproduced, Mbr is a maximum data transfer rate (Mbps) of the DVD-Audio disk, N is a maximum number of recording channels as determined by the maximum data transfer rate, sampling frequency and quantization bit number of the DVD-Audio



disk.

14. (NOT AMENDED) The apparatus as claimed in claim 9, wherein if said audio coding mode is pseudo lossless compression coding, the encoding unit determines said first to third quantization bit numbers of the data to be reproduced before compression to be respectively 16bits, 20bits and 24bits, said first to third sampling frequencies to be respectively 44.1KHz, 88.2KHz and 176.4KHz, a maximum number of said audio channels to be 8, and the number of said channels is determined by the following equation:

$$N = \frac{Mbr * Ccr}{Fs * Qb};$$

wherein,

Fs is the sampling frequency (Hz) of the data to be reproduced, Qb is the quantization bit number (bits) of the data to be reproduced, Mbr is a maximum data transfer rate (Mbps) of the DVD-Audio disk, Ccr is a compression ratio according to a DTS compression coding system, and N is a maximum number of recording channels determined by the maximum data transfer rate, sampling frequency and quantization bit number of the DVD-Audio disk.

15. (NOT AMENDED) An apparatus to record audio data and control information of said audio data on a DVD, the apparatus comprising:

an encoding unit to generate said audio data and said control information of said audio data; and

an optical pickup to record the audio data and the control information in an audio directory of the DVD.

16. (NOT AMENDED) The apparatus as claimed in claim 15, wherein said encoding unit

samples said audio data at a sampling frequency of one of 176.4KHz and 192KHz.

17. (NOT AMENDED) An apparatus to record audio data on a DVD, comprising:  
an encoder to encode the audio data; and  
an optical pickup to record the audio data, audio titles each having an audio title set management table followed by a plurality of contiguous audio objects, a plurality of audio stream attributes each having an audio coding mode, a quantization bit number, a sampling frequency and decoding algorithm information relating to a number of audio channels of said audio data on the DVD, wherein each of said audio objects includes a plurality of audio packs having portions of said audio data corresponding to said decoding algorithm stored in said audio stream attribute.

18. (NOT AMENDED) The apparatus as claimed in claim 17, wherein each of said audio packs comprises:

a pack header;  
a packet header;  
a sub-stream identification value;  
stuffing frame information;  
audio frame information; and  
one of said portions of said audio data.

19. (NOT AMENDED) The apparatus as claimed in claim 18, wherein said pack header is 14 bytes, said packet header is 1 byte, said sub-stream identification value is 1 byte, said stuffing frame information is 1 byte, said audio frame information is 3 bytes, and said one portion of said audio data is between 1 and 2013 bytes of linear pulse code modulated (PCM)

data.

20. (NOT AMENDED) The apparatus as claimed in claim 17, wherein each of said audio packs comprises:

- a pack header;
- a packet header;
- a sub-stream identification value;
- audio frame information; and
- one of said portions of said audio data.

21. (NOT AMENDED) The apparatus as claimed in claim 20, wherein said pack header is 14 bytes, said packet header is 1 byte, said sub-stream identification value is 1 byte, said audio frame information is 3 bytes and said one portion of said audio data is between 1 and 2016 bytes of Dolby AC-3 data.

22. (NOT AMENDED) The apparatus as claimed in claim 17, wherein each of said audio packs comprises:

- a pack header;
- a packet header; and
- one of said portions of said audio data.

23. (NOT AMENDED) The apparatus as claimed in claim 22, wherein said pack header is 14 bytes, said packet header is 1 byte, and said one portion of said audio data is between 1 and 2020 bytes of MPEG data.

24. (NOT AMENDED) The apparatus as claimed in claim 17, wherein each of said audio packs comprises:

- a pack header;
- a first packet header for a main audio frame;
- a first one of said portions of said audio data in said main audio frame;
- a second packet header for an extension audio frame; and
- a second one of said portions of said audio data in said extension audio frame.

25. (NOT AMENDED) The apparatus as claimed in claim 24, wherein said pack header is 14 bytes, said first packet header is 1 byte, said first portion of said audio data is between 1 and 1152 bytes of MPEG data, said second packet header is 1 byte, and said second portion of said audio data is between 1 and 1584 bytes of MPEG data.

26. (NOT AMENDED) The apparatus as claimed in claim 17, wherein each of said audio packs further comprises a padding packet which is increased based upon a number of samples of said audio data.

27. (NOT AMENDED) The apparatus as claimed in claim 17, wherein said sampling frequency is approximately 48 KHz, said quantization bit number is 24 bits, and said number of audio channels is 10, when said audio data is linear pulse code modulated (PCM) data.

28. (NOT AMENDED) The apparatus as claimed in claim 17, wherein a compression rate of said audio data is approximately 2:1 for lossless psychoacoustic coding and approximately 4:1 for lossless pseudo psychoacoustic coding.

29. (NOT AMENDED) An apparatus for storing audio information on a DVD-Audio disk, the apparatus comprising:

an encoder to encode the audio information; and

an optical pickup to record the audio information in both video and audio directories of the DVD-Audio disk so that both of said video and audio directories contain only audio information.

30. (NOT AMENDED) A method of recording data and information on said data on a DVD-Audio disk, the method comprising:

encoding the data and the information on said data; and

recording the data in a data zone of the DVD-Audio disk and recording the information on said data to be reproduced in an information zone of the DVD-Audio disk, said information zone includes directories of a video title set (VIDEO\_TS) and an audio title set (AUDIO\_TS), wherein said AUDIO\_TS directory includes information on an audio manager (AMG) having information on audio titles, wherein said data zone includes said audio titles each having audio title set information (ATSI) followed by a plurality of contiguous audio objects (AOBs), said ATSI includes a plurality of audio stream attributes each having an audio coding mode, a first, second or third quantization bit number corresponding to the data to be reproduced, a first, second, third, fourth, fifth or sixth sampling frequency corresponding to the data to be reproduced, and decoding algorithm information relating to a number of audio channels of the data to be reproduced, and each of said AOBs includes a plurality of audio packs recorded with audio data corresponding to the decoding algorithm stored in the audio stream attribute.

31. (NOT AMENDED) A method of recording data and information on said data on a DVD, the method comprising:

encoding the data and the information on said data; and

recording the data in a data zone of the DVD and recording the information on said data to be reproduced in an information zone of the DVD, said information zone storing directories of a video title set (VIDEO\_TS) and an audio title set (AUDIO\_TS), wherein said AUDIO\_TS includes information on an audio manager (AMG) which stores information on audio titles and said VIDEO\_TS includes information on a video manager (VMG) which stores information on video titles.

32. (NOT AMENDED) A method of recording audio data and information on the audio data on a DVD-Audio and a DVD-Video, the method comprising:

encoding the audio data at a sampling frequency of one of 176.4 KHz and 192KHz and the information on the data; and

recording the data and the information on the data in an audio directory of the DVD.

33. (NOT AMENDED) A method of recording audio data and information on the audio data on a DVD-Audio and a DVD-Video, the method comprising:

encoding the data at a sampling frequency of one of 176.4 KHz and 192KHz and the information on the data if the DVD is a DVD-Audio and encoding the data at a sampling frequency of one of 88.2KHz and 96KHz and the information on the data if the DVD is a DVD-Video; and

recording the data and the information on the data in an audio directory of the DVD if the DVD is the DVD-Audio, and recording the data and the information on the data in a video directory of the DVD if the DVD is the DVD-Video.

34. (NOT AMENDED) A method of recording data and information on the data on a

DVD, the method comprising:

encoding the data at a sampling frequency of 192KHz and the information on the data;  
dividing the encoded data into data of 96KHz and data of 192KHz; and  
recording the data of 192KHz as audio titles in an AUDIO\_TS directory of the DVD and  
recording the data of 96KHz as video titles in a VIDEO\_TS directory.

35. (NOT AMENDED) The method of claim 34, wherein the encoding comprises  
encoding the data by linear PCM lossless encoding.

36. (NEW) An apparatus to record data on a DVD, comprising:  
an encoder to encode data comprising an audio manager (AMG) having information on  
audio titles (ATS), each ATS having audio title set information (ATSI) followed by contiguous  
audio objects (AOBs) in an audio title set (AUDIO\_TS) of the DVD, said encoder to indicate and  
differentiate sampling frequencies for the audio data to be recorded using the ATSI, the  
sampling frequencies including 176.4 KHz and 192 KHz; and  
an optical pickup to record the data on the DVD.

37. (NEW) The apparatus as claimed in claim 36, wherein the sampling frequencies  
further comprise 48 KHz, 96 KHz, 44.1 KHz, and 88.2 KHz.

38. (New) The apparatus as claimed in claim 37, wherein the ATSI further indicates an  
audio coding mode is linear pulse code modulated (PCM) audio, and first to third quantization  
bit numbers are respectively 16bits, 20bits and 24bits.

39. (NEW) The apparatus as claimed in claim 37, wherein the ATSI further indicates an

audio coding mode is a compression coding system, and first to third quantization bit numbers of the audio data before compression are respectively 16bits, 20bits and 24bits.

40. (NEW) The apparatus as claimed in claim 36, wherein the ATSI further comprises value fields, the sampling frequencies comprise first to sixth sampling frequencies including the 176.4 Khz and 192 Khz sampling frequencies, and the ATSI indicates the first to six sampling frequencies by corresponding states of two of the value fields.

41. (NEW) The apparatus as claimed in claim 40, wherein one of the two value fields indicates whether the sampling frequency is one of 176.4 Khz and 192 Khz.

42. (NEW) The apparatus as claimed in claim 41, wherein,  
the other of the two value fields has a state, and, if the one value field indicates the sampling frequency is one of 176.4 Khz and 192 Khz, the state of the other value field indicates the sampling frequency is 176.4 Khz or 192 Khz.

43. (NEW) The apparatus as claimed in claim 40, wherein,  
a first of the two value fields has a first or a second state, the first state indicates the sampling frequency is one of 44.1KHz, 88.2KHz and 176.4KHz, and the second state indicates the sampling frequency is one of 48KHz, 96KHz, and 192KHz,  
a second of the two value fields has a state which indicates the sampling frequency is 176.4 KHz or 192 KHz.



**Serial No. 09/618,731**

**Docket No. 1317.1014CIPCIP/MDS/JGM**

If there are any additional fees associated with the filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

By: 

Michael D. Stein

Registration No. 37,240

700 Eleventh Street, N.W.  
Suite 500  
Washington, D.C. 20001  
Telephone: (202) 434-1500  
Facsimile: (202) 434-1501

Date: 7/19/01